Topic 15 - Probabilities

Test ID: 8450917

Question #1 of 21

Question ID: 438710

A company says that whether its earnings increase depends on whether it increased its dividends. From this we know:

✗ **A)** **P(dividend increase or earnings increase) = P(both dividend and earnings increase).**

✗ **B)** P(both dividend increase and earnings increase) = P(dividend increase).

✗ **C)** P(dividend increase | earnings increase) is not equal to P(earnings increase).

✓ **D)** P(earnings increase | dividend increase) is not equal to P(earnings increase).

Explanation

If two events A and B are dependent, then the conditional probabilities of P(A|B) and P(B|A) will not equal their respective unconditional probabilities (of P(A) and P(B), respectively). The other choices may or may not occur, e.g., P(A | B) = P(B) is possible but not necessary.

Question #2 of 21

Question ID: 438722

A conditional expectation involves:

✗ **A)** **determining the expected joint probability.**

✗ **B)** estimating the skewness.

✗ **C)** calculating the conditional variance.

✓ **D)** refining a forecast because of the occurrence of some other event.

Explanation

Conditional expected values are contingent upon the occurrence of some other event. The expectation changes as new information is revealed.

Question #3 of 21

Question ID: 438709

An investor is choosing one of twenty securities. Ten of the securities are stocks and ten are bonds. Four of the ten stocks were issued by utilities, the other six were issued by industrial firms. Two of the ten bonds were issued by utilities, the other eight were issued by industrial firms. If the investor chooses a security at random, the probability that it is a bond or a security issued by an industrial firm is:

✓ **A)** **0.80.**

✗ **B)** 0.50.

✗ **C)** 0.60.

✗ **D)** 0.70.

Explanation

Let B represent the set of bonds and I the set of industrial firms. The desired probability is the probability of the union of sets B and I, P(B I). According to the theorems of probability, P(B I)=P(B)+P(I)-P(B∩I), where P(B) is the probability that a security is a bond=P(B)=10/20, P(I) is the probability that a security was issued by an industrial firm=P(I)=14/20, and P(B∩I) is the probability that a security is both a bond and issued by an industrial firm=P(B∩I)=8/20. 10/20+14/20-8/20=16/20=0.80.

Question #4 of 21

Question ID: 438725

A joint probability of A and B must always be:

✓ **A)** **less than or equal to the conditional probability of A given B.**

✗ **B)** greater than or equal to than the probability of A or B.

✗ **C)** greater than or equal to the conditional probability of A given B.

✗ **D)** less than the probability of A and the probability of B.

Explanation

By the formula for joint probability: P(AB)=P(A|B) × P(B), since P(B) ≤ 1, then P(AB) ≤P(A|B). None of the other choices must hold.

Question #5 of 21

Question ID: 438723

Dependent random variables are defined as variables where their joint probability is:

✓ **A)** **not equal to the product of their individual probabilities.**

✗ **B)** equal to zero.

✗ **C)** equal to the product of their individual probabilities.

✗ **D)** greater than the product of their individual probabilities.

Explanation

Dependence results between random variables when their joint probabilities are not equal products of individual probabilities. If they are equal, then an independent relationship exists.

Question #6 of 21

Question ID: 438711

Thomas Baynes has applied to both Harvard and Yale. Baynes has determined that the probability of getting into Harvard is 25% and the probability of getting into Yale (his father's alma mater) is 42%. Baynes has also determined that the probability of being accepted at both schools is 2.8%. What is the probability of Baynes being accepted at either Harvard or Yale?

✗ **A)** **7.7%.**

✗ **B)** 67.0%.

✗ **C)** 10.5%.

✓ **D)** 64.2%.

Explanation

Using the addition rule, the probability of being accepted at Harvard or Yale, is equal to: P(Harvard) + P(Yale) − P(Harvard and Yale) = 0.25 + 0.42 − 0.028 = 0.642 or 64.2%.

Question #7 of 21

Question ID: 438726

The probability of a new Wal-Mart being built in town is 64%. If Wal-Mart comes to town, the probability of a new Wendy's restaurant being built is 90%. What is the probability of a new Wal-Mart and a new Wendy's restaurant being built?

- ✗ **A)** **0.306.**
- ✗ **B)** 0.675.
- ✗ **C)** 0.240.
- ✓ **D)** 0.576.

Explanation

P(AB) = P(A|B) × P(B)
The probability of a new Wal-Mart and a new Wendy's is equal to the probability of a new Wendy's "if Wal-Mart" (0.90) times the probability of a new Wal-Mart (0.64). (0.90)(0.64) = 0.576.

Question #8 of 21

Question ID: 438721

A dealer in a casino has rolled a five on a single die three times in a row. What is the probability of her rolling another five on the next roll, assuming it is a fair die?

- ✗ **A)** **0.200.**
- ✗ **B)** 0.500.
- ✓ **C)** 0.167.
- ✗ **D)** 0.001.

Explanation

The probability of a value being rolled is 1/6 regardless of the previous value rolled.

Question #9 of 21

Question ID: 438720

X and *Y* are discrete random variables. The probability that X = 3 is 0.20 and the probability that Y = 4 is 0.30. The probability of observing that X = 3 and Y = 4 concurrently is *closest* to:

- ✗ **A)** **0.06.**
- ✗ **B)** 0.
- ✗ **C)** 0.50.
- ✓ **D)** Cannot answer with the information provided.

Explanation

If you knew that *X* and *Y* were independent, you could calculate the probability as 0.20(0.30) = 0.06. Without this knowledge, you would need the joint probability distribution.

Question #10 of 21

Question ID: 438707

Which of the following statements about probability is *most* accurate?

- ✗ **A)** **An outcome is the calculated probability of an event.**
- ✗ **B)** Out of a sample of 100 widgets 10 were found to be defective, 20 were perfect, and 70 were OK. The probability of picking a perfect widget at random is 29%.
- ✓ **C)** An event is a set of one or more possible values of a random variable.
- ✗ **D)** A conditional probability is the probability that two or more events will happen concurrently.

Explanation

Conditional probability is the probability of one event happening given that another event has happened. An outcome is the numerical result associated with a random variable. The probability of picking a perfect widget is 20 / 100 = 0.20 or 20%.

Question #11 of 21

Question ID: 438717

The probabilities that three students will earn an A on an exam are 0.20, 0.25, and 0.30, respectively. If each student's performance is independent of that of the other two students, the probability that all three students will earn an A is *closest* to:

- ✓ **A)** **0.0150.**
- ✗ **B)** 0.0075.
- ✗ **C)** 0.0010.
- ✗ **D)** 0.7500.

Explanation

Since the events are independent, the probability is obtained by multiplying the individual probabilities. Probability of three As = (0.20) × (0.25) × (0.30) = 0.0150.

Question #12 of 21

Question ID: 438718

An investor has an A-rated bond, a BB-rated bond, and a CCC-rated bond where the probabilities of default over the next three years are 4 percent, 12 percent, and 30 percent, respectively. What is the probability that *all* of these bonds will default in the next three years if the individual default probabilities are independent?

- ✗ **A)** **1.44%.**
- ✓ **B)** 0.14%.
- ✗ **C)** 46.00%.
- ✗ **D)** 23.00%.

Explanation

Since the probability of default for each bond is independent, $P(A \cap BB \cap CCC) = P(A) \times P(BB) \times P(CCC) = 0.04 \times 0.12 \times 0.30 = 0.00144$ = 0.14%.

Question #13 of 21

Question ID: 438713

If the outcome of event A is not affected by event B, then events A and B are said to be:

- ✗ **A)** **mutually exclusive.**
- ✓ **B)** statistically independent.
- ✗ **C)** conditionally dependent.
- ✗ **D)** collectively exhaustive.

Explanation

If the outcome of one event does not influence the outcome of another, then the events are independent.

Question #14 of 21

Question ID: 438724

If the probability of both a new Wal-Mart and a new Wendy's being built next month is 68% and the probability of a new Wal-Mart being built is 85%, what is the probability of a new Wendy's being built if a new Wal-Mart is built?

- ✗ **A)** **0.85.**
- ✓ **B)** 0.80.
- ✗ **C)** 0.70.
- ✗ **D)** 0.60.

Explanation

P(AB) = P(A|B) × P(B)
0.68 / 0.85 = 0.80

Question #15 of 21

Question ID: 438708

If X and Y are independent events, which of the following is *most* accurate?

- ✗ **A)** **P(X or Y) = (P(X)) × (P(Y)).**
- ✓ **B)** P(X | Y) = P(X).
- ✗ **C)** X and Y cannot occur together.
- ✗ **D)** P(X or Y) = P(X) + P(Y).

Explanation

Note that events being independent means that they have no influence on each other. It does not necessarily mean that they are mutually exclusive. Accordingly, P(X or Y) = P(X) + P(Y) − P(X and Y). By the definition of independent events, P(X|Y) = P(X).

Question #16 of 21

Question ID: 438706

Let A and B be two mutually exclusive events with P(A) = 0.40 and P(B) = 0.20. Therefore:

- ✗ **A)** **P(A and B) = 0.08.**
- ✗ **B)** P(A or B) = 0.52.
- ✓ **C)** P(A and B) = 0.
- ✗ **D)** P(B|A) = 0.20.

Explanation

If the two evens are mutually exclusive, the probability of both ocurring is zero.

Question #17 of 21

Question ID: 438712

The following table summarizes the availability of trucks with air bags and bucket seats at a dealership.

	Bucket seats	*No Bucket Seats*	*Total*
Air Bags	75	50	125
No Air Bags	35	60	95
Total	110	110	220

What is the probability of randomly selecting a truck with air bags and bucket seats?

- ✓ **A)** **0.34.**
- ✗ **B)** 0.57.
- ✗ **C)** 0.28.
- ✗ **D)** 0.16.

Explanation

75 / 220 = 0.34.

Question #18 of 21

Question ID: 438714

The following table summarizes the availability of trucks with air bags and bucket seats at a dealership.

	Bucket Seats	*No Bucket Seats*	*Total*
Air Bags	75	50	125
No Air Bags	35	60	95
Total	110	110	220

What is the probability of selecting a truck at random that has either air bags or bucket seats?

- ✓ **A)** **73%.**
- ✗ **B)** 50%.
- ✗ **C)** 34%.
- ✗ **D)** 107%.

Explanation

The addition rule for probabilities is used to determine the probability of at least one event among two or more events occurring. The probability of each event is added and the joint probability (if the events are not mutually exclusive) is subtracted to arrive at the solution. P(air bags or bucket seats) = P(air bags) + P(bucket seats) − P(air bags and bucket seats) = (125 / 220) + (110 / 220) − (75 / 220) = 0.57 + 0.50 − 0.34 = 0.73 or 73%.

Alternative: 1 − P(no airbag and no bucket seats) = 1 − (60 / 220) = 72.7%

Question #19 of 21

Question ID: 438719

If two fair coins are flipped and two fair six-sided dice are rolled, all at the same time, what is the probability of ending up with two heads (on the coins) and two sixes (on the dice)?

- ✗ **A)** **0.8333.**
- ✗ **B)** 0.4167.
- ✗ **C)** 0.0039.
- ✓ **D)** 0.0069.

Explanation

For the four independent events defined here, the probability of the specified outcome is 0.5000 × 0.5000 × 0.1667 × 0.1667 = 0.0069.

Question #20 of 21

Question ID: 438715

Given the following table about employees of a company based on whether they are smokers or nonsmokers and whether or not they suffer from any allergies, what is the probability of both suffering from allergies and not suffering from allergies?

	Suffer from Allergies	*Don't Suffer from Allergies*	*Total*
Smoker	35	25	60
Nonsmoker	55	185	240
Total	90	210	300

- ✗ **A)** **0.50.**
- ✗ **B)** 0.24.
- ✗ **C)** 1.00.
- ✓ **D)** 0.00.

Explanation

These are mutually exclusive, so the joint probability is zero.

Question #21 of 21

Question ID: 438716

If a fair coin is tossed twice, what is the probability of obtaining heads both times?

- ✗ **A)** **1.**

- ✗ **B)** 3/4.
- ✗ **C)** 1/2.
- ✓ **D)** 1/4.

Explanation

The probability of tossing a head, H, is P(H) = 1/2. Since these are independent events, the probability of two heads in a row is $P(H \cap H) = P(H) \times P(H) = 1/2 \times 1/2 = 1/4$.